Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: **4338** Type: **Poster (Non-Student) / Affiche (Non-étudiant(e))**

(POS-35) Modeling the cooperative compaction of bacterial chromosomes by biomolecular crowding and the cross-linking protein H-NS

Tuesday 28 May 2024 17:59 (2 minutes)

The way chromosomes are spatially organized influences their biological functions. Cells orchestrate the action of various molecules toward organizing their chromosomes: chromosome-associated proteins and the surrounding "free"molecules often referred to as crowders. Chain molecules like chromosomes can be entropically condensed in a crowded medium. A number of recent experiments showed that the presence of the protein H-NS enhances the entropic compaction of bacterial chromosomes by crowders. Using a coarse-grained computational model, we discuss the physical effects on bacterial chromosomes H-NS and crowders bring about. In this discussion, a H-NS dimer is modeled as a mobile binder with two binding sites, which can bind to a chromosome-like polymer with characteristic binding energy. Using the model, we will clarify the relative role of biomolecular crowding and H-NS in condensing a bacterial chromosome, offering quantitative insights into recent chromosome experiments. In particular, they shed light on the nature and degree of crowder and H-NS synergetics: while the presence of crowders enhances H-NS binding to a bacterial chromosome, the presence of H-NS makes crowding effects more efficient, suggesting two-way synergetics in condensing the chromosome.

Keyword-1

computational modeling

Keyword-2

chromosome organization

Keyword-3

Author: HA, Bae-Yeun

Co-authors: SADEGHI, Amir; JUNG, Youngkyun

Presenter: HA, Bae-Yeun

Session Classification: DPMB Poster Session & Student Poster Competition (28) | Session d'affiches DPMB et concours d'affiches étudiantes (28)

Track Classification: Technical Sessions / Sessions techniques: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)